

Transportation Engineering
Transportation Facility Design

01TR0211

(PEC)

Objective of the Course:

- The objective of the course is to introduce the basic concepts of analysis and design of pavement structure.
- The current trends in design considering cumulative fatigue damage due to the combined effect of load and pavement temperature in rigid pavement are included in the present study.
- The study of recent development in design considering fatigue resistant mix and rut resistant mix for improving properties of various bituminous mixes are also included.
- It includes the study of various types of failures of pavement and its remedial measures.
- It is necessary to reduce the cost of repairs and maintenance.
- The knowledge of construction techniques of various types of roads is backbone for the students. Various evaluation techniques are also covered in the course.

Credit Earned: 3
Students learning outcomes:

After successful completion of the course it is expected that student will be able to,

1. To analyze factors affecting for the facility given in details, information and data set and able to present frameworks for mechanistic-empirical design methods for transportation facilities required for the users
2. To design different types of motorized and non-motorized transportation facility using standard procedures and have knowledge of failures in given transportation facilities along with aesthetic and safety aspects
3. To describe various methods of transportation facilities of different types of intersections, terminals, roadways and their components, specifications and tests thereof
4. To assess the problems / causes of failures in highway, terminals, pedestrian facilities in specific conditions and suggest preventive measures thereof
5. To explain techniques to evaluate facilities of transport, evaluation techniques of different facilities, describe techniques of maintenance and strengthening, and suggest remedies

Teaching and Examination Scheme

| Teaching Scheme (Hours) | | | Credits | Theory Marks | | | Tutorial/ Practical Marks | | Total Marks |
|-------------------------|----------|-----------|---------|--------------|--------|---------|---------------------------|----------------|-------------|
| Theory | Tutorial | Practical | | ESE (E) | IA (M) | CSE (I) | Viva (V) | Term Work (TW) | |
| 03 | 00 | 00 | 03 | 50 | 30 | 20 | 25 | 25 | 150 |

Detailed Syllabus

| Sr No. | Title of the unit | Number of hours |
|----------|---|-----------------|
| 1 | Introduction | 06 |
| | Design of highways, design of at-grade intersections, design of signalized intersection, design of grade separated intersection, terminal design, and design of facilities for non-motorized transport. | |
| 2 | Terminal Planning & Design | 10 |

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| | Terminal functions, analysis of terminals, process flow charts of passenger & goods terminals, terminal processing time, waiting time, capacity & level of service concept, study of typical facilities of highway, railway, airport and waterway terminals, concept of inland port. | |
| 3 | Design of Highways: | 10 |

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| | Hierarchy of highway system, functions, design designations, concepts in horizontal & vertical alignment, integration, optical design, geometrical | |
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| | standards for mobility & accessibility components, cycle track design, bridge architect, landscaping and safety considerations, evaluation and design of existing geometrics. | |
| 4 | Design of Intersections | 10 |
| | Review of design of at-grade intersections, signal coordination- graphic methods & computer techniques, grade separated intersections- warrants for selection, different types & geometric standards, spacing & space controls, ramps & gore area design. | |
| 5 | Pedestrian Facility Design | 06 |
| | Footpath, Zebra crossings, Foot over bridge, Under pass, Pedestrian precincts, Pedestrian actuated signals | |
| | Total | 42 |

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

| Distribution of Theory for course delivery and evaluation | | | | | |
|---|------------|-------|---------|----------|--------|
| Remember | Understand | Apply | Analyze | Evaluate | Create |
| 05% | 05% | 20% | 25% | 25% | 20% |

Instructional Method and Pedagogy:

1. Use of Learning Management system like canvas
2. Demonstration through presentations on power point and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

Recommended Study Material:
Reference Book:

1. Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna publishers.
2. Salter, R.J., Highway Traffic Analysis and Design, ELBS.
3. Edward K. Morlock, Introduction to Transportation Engineering & Planning, International Student Edition, Mc-Graw Hill Book Company, New York.
4. Khanna S.K., Arora M.G., Jain S.S., Airport Planning & Design, Nemchand Bros., Roorkee
5. Horenjeff Robert, The planning & Design of Airports, McGraw Hill Book Co.
6. Saxena S.C., Railway Engineering, Dhanpat Rai & Sons, 1995.
7. Vukan R. Vuchic, Urban Transit : Operations, Planning and Economics, Wiley Sons Publishers.
8. Bindra S.P., Docks & Harbour Engineering, Dhanpat Rai Publications,
9. Srinivasan R., Harbours, Docks & Tunnel Engineering, Charotar Publishing House, Anand, 1999.
10. IRC-SP41-1994: Guidelines for the Design of At-Grade Intersections in Rural & Urban Areas
11. IRC-73-1980: Geometric Design for Rural Highways
12. IRC-86-1983: Geometric Design Standards for Urban Roads in Plains
13. IRC-38-1988: Guidelines for Design of horizontal curves for Highway and design tables
14. IRC-103-2012: Guidelines for Pedestrian Facilities (First Revision)
15. IRC-11-2015: Recommended Practice for the Design and Layout of Cycle Tracks (First Revision)